AMERICAN
MECHANICS' MAGAZINE,
Museum, Register, Journal and Gazette.

VOL. I.—No. 20.] SATURDAY, JUNE, 18, 1825. [Price $4 PER ANN.

"He who does his best, however little, is always to be distinguished from him who does nothing."—*Dr. Johnson.*

IMPROVED POTATO-WASHER.

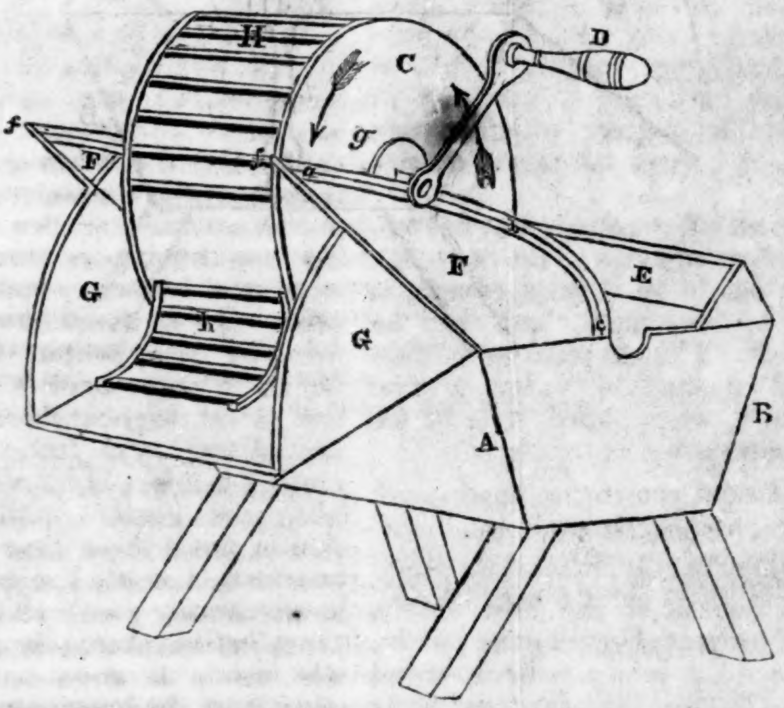
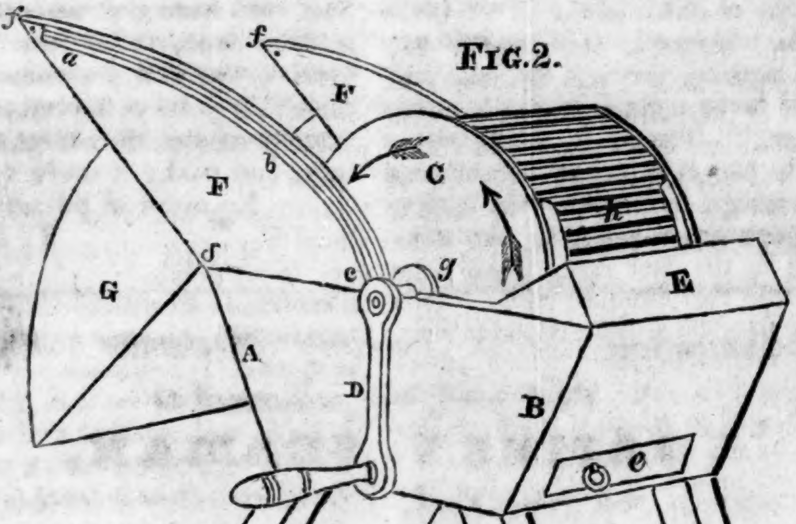


FIG. 2.



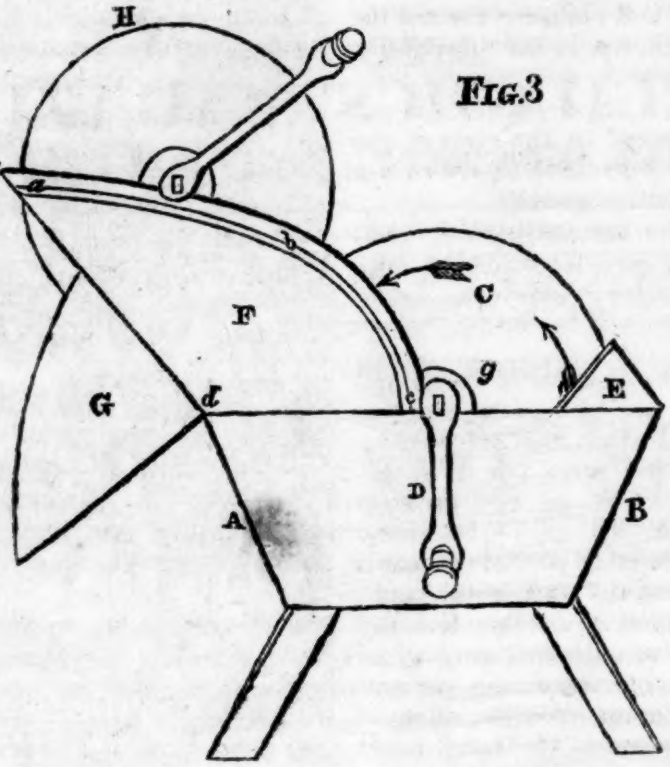


FIG. 3

IMPROVED POTATO-WASHER.

SIR,—I send you three illustrative Drawings, namely, a back and front perspective, and a profile view. The letters refer to the same parts in each.

Description.

AB is a wooden trough, on four strong legs, of which I shall call A the front, and B the back.

C, a hollow cylinder, consisting of two circular wooden ends, which are connected together at their circumference by rails or spars about one inch square, and about the same distance apart. Eight or ten of these rails are framed together to form a door, *h*, which is made fast by two bolts sunk flush in the first rail; these bolts shoot into the two circular ends. This cylinder is fixed on a strong wooden axis, about two inches diameter, which passes through the two ends and the whole length of it, and on which it revolves, being turned by the winch, D.

E is a hood or cap, to prevent the water in the trough (which should be nearly full) from being driven over the end by the cylinder when in motion.

FF are two upright arms, wings, or brackets, springing from the sides of the trough, close to the hollow in which the axis works. As these answer the purpose of the jib of a crane, they must be carried as far forward as to allow the cylinder to clear the front edge of the trough. The edges of these wings, from *c* to *b*, must rise very bold, nearly a segment of a circle, of which *d c* must be the radius; and from *a* to *b* they should form an inclined plane.

a b c is a ledge projecting a little from the outside of each wing, and running in a direction parallel with the edge of it only a little below the edge. These ledges must each have a groove or hollow to receive the cord or line, and to keep it in its proper direction.

G is a spout or shoot, to direct the potatoes into a basket or other receptacle, when they are discharged from the cylinder. In my potato-washer this spout turns on centres at *d*, so as to shut in between the wings FF, and occupy less room when the machine is not in use.

e, A long wooden plug, bevelled inwards at the edges, with a strong iron ring. By this the water is discharged with a sudden impetus, so as to carry away the dirt with it.

At the extreme points, *ff*, of the wings, FF, are fastened two small but strong cords of equal length, made of good green hemp, and formed into loops at the other extremity. These are long enough to reach along the ledges, *a b c*, to the axis of

the cylinder, in each end of which is a small strong wire hook, sunk in a hollow, so as to lie flush, and pointing toward the front of the trough, *i. e.* in the direction of the motion.

g is a collar or broad shoulder round the axis, and fastened to the ends of the cylinder, to keep it parallel to the wings and to the sides of the trough.

The cylinder of my machine is about 20 inches in diameter, and 19 inches long. This contains a bushel of potatoes. There should be just room left for the potatoes to move a little.

After turning the cylinder in the trough till the potatoes are clean, the lines or cords must be laid along the ledges, *a b c*, and the loops of the cords are to be attached to the hooks in the axis on each side. The motion is then to be continued; when, as the other ends of the cords are fixed at *f f*, and the axis is not confined, the axis will gather up the cord, and be lifted, with the cylinder, out of the trough, and carried forward over the front edge; the axis running upon the edges of the wings, as represented at H, fig. 1 and 3. The door is then to be opened, and the potatoes discharged. By reversing the motion the cylinder will be again lowered into the trough, and the hooks released from the cords. If it be preferred, instead of loops the cords may have pins attached to them, to fit into holes in the axis. When the cylinder is full, it weighs about 90 lbs. A boy of eight or ten years old may raise it with ease. If the cylinder be only in part filled, it will require more strength to work it. It is scarcely necessary to point, that the front feet of the washer must project sufficiently forward to allow a perpendicular from the centre of gravity to fall within the base, when the cylinder is raised out of the trough, as at H, figs. 1, 3.

I am, Sir,
Your obedient servant,
C. W.

Nov. 15th, 1824.

SOME ACCOUNT OF THE LATE M. GUINAND, AND OF THE IMPORTANT DISCOVERY MADE BY HIM IN THE MANUFACTURE OF FLINT GLASS FOR LARGE TELESCOPES.

It has long been a desideratum among opticians and astronomers to obtain glass adapted to the manufacture of lenses of large dimensions for Telescopes. Notwithstanding the great labour and expense bestowed upon them, all experiments for that purpose had till recently proved fruitless. Within these few years the obstacles which impeded its attainment have been surmounted, and lenses have been made of a perfectly homogeneous glass, without striæ, or any other defects, and to the extent of even eighteen inches in diameter. This improvement, which may be considered of great moment to science, as it will enable opticians to construct instruments of much higher power and more complete efficacy than those hitherto employed, and afford to astronomers a greatly extended range of observation, has been attributed by some persons to M. Frauenhofer, a celebrated optician of Favaria. Feelings of justice, however, have induced a generous lover of science (who has favoured the public with the initials of his name only—C. P. d. B.) to publish a translation into English of a paper read, some time ago, before the Society of Physics and Natural History of Geneva, which shows most satisfactorily that it is to the ingenuity and perseverance of a humble mechanic of Switzerland, of the name of Guinand, that we are really indebted for the accomplishment of this important object.

"Nearly seventy years," says the Memoir, "have elapsed since this interesting man, now on the verge of fourscore, and residing in a remote village among the mountains of Neufchatel in Switzerland, was employed in assisting his father as a joiner; and his present manner of reading and writing show that he scarcely obtained the first rudiments of education. At the age of thirteen or fourteen he became a cabinet-maker, and occupied himself chiefly in making clock-cases.

"At this period he had become acquainted with a buckle-maker who lived in his neighbourhood, and of whom he learned the art of casting and working in various metals, which enabled him, about the age of twenty, after once witnessing the process, to attempt the construction of a watch-case; having succeeded he adopted the occupation of a watch-case-maker, which was then very lucrative.

"Having constructed clock-cases for M. Jaquet Droz, he had an opportunity of

seeing at the house of that celebrated mechanist, a very fine English reflecting telescope, which appeared to him extremely curious and interesting. Those instruments were at that time very rare in Switzerland, especially among the mountains. M. Guinand was then in his twentieth or twenty-third year, and it cannot be doubted that this circumstance, in itself unimportant, first turned his mind towards that subject, to which, encouraged by success, he afterwards more particularly devoted himself.

"Be that as it may, M. Guinand having expressed a wish to be allowed to take to pieces this telescope, that he might examine it in detail, M. Jaquet Droz, who had noticed the dexterity of the young man, kindly gave him permission, and, with equal good-nature, relieved him from his apprehension of being unable to put it together again, by taking that task upon himself if it should prove too difficult for him. Thus encouraged, M. Guinand took the instrument to pieces; accurately measured the curves of the reflectors and glasses, and afterwards readily put it together; then availing himself of the few notions of metallurgy which he had gained from his friend the buckle-maker, as well as of the experience he had acquired in casting ornaments for clock-cases, he attempted the construction of a similar telescope; and his second experiment succeeded so well, that on a comparative trial of his own instrument with that which had been its model, in presence of a great number of persons, it was impossible to determine to which of them the preference was due.

"M. Jaquet Droz, surprised at this success, asked our artist what treatise on optics he had followed for his guide; but he was still more surprised when the young man told him that he was not acquainted with any; he placed one in his hands, and it was not until this period that M. Guinand studied, or rather deciphered (for, as we have already observed, he reads with difficulty) the principles of that science.

"About the same time occurred another fortunate circumstance, in itself as trivial as the former. Having been always weak-sighted, he found, when he began to make watch-cases, that the spectacles, which had hitherto answered his purpose, were no longer of service; and being directed to a person whose glasses were said to have given great satisfaction, he obtained a pair which really suited him no better than the others; but by looking on while they were in progress, he learned the art of forming and polishing the lenses. He therefore undertook to make spectacles, not only for himself, but for various other persons, who pronounced them excellent. This new acquirement he found very useful in his favourite pursuit: and he amused himself in manufacturing great numbers of telescopes of an inferior quality, for which he made the tubes himself, generally of pasteboard. He also studied the small number of works he was able to procure, which treated on subjects connected with optics.

"Meanwhile the ingenious and important discovery of achromatic glasses was beginning to spread; and having reached that country, it could not fail to be very interesting to M. Guinand, who listened with avidity to all that he heard on this subject. M. Jaquet Droz having procured one of these new glasses, permitted M. Guinand, as in the instance of the reflecting telescope, to take it to pieces, and to separate the lenses. It will readily be conceived, that the purpose of the latter was to attempt the construction of a similar instrument; but in this he was impeded by the difficulty of procuring glasses of different refractive power. It was not until some years afterwards that an acquaintance of his, M. Recordon, having proceeded to England, where he obtained a patent for his invention of self-winding watches, which were then in great request, brought him from that country some flint-glass; and though the specimen was much striated, he found means to manufacture from it some tolerably good achromatic glasses. Having obtained supplies of this material on various occasions, and having seen other glasses besides those of M. Jaquet Droz, he easily ascertained that flint-glass, not extremely defective, is rarely to be met with. Thus convinced of the impossibility of procuring it of that quality which he ardently wished to obtain for the construction of his telescopes, and having by his various labours become sufficiently skilled in the art of fusion, he melted in his blast-furnace the fragments of this flint-glass; no satisfactory result was obtained, but he discovered from some particles of lead, which reappeared during the process, that this metal was a constituent in the composition of flint-glass. At the time of this first experiment he had attained his thirty-fifth or thirty-sixth year. The ardent desire to obtain some of this glass then induced him to collect, from the different works he was able to procure, such notions of chemistry as might

be useful to him in his attempts at vitrification; and during six or seven years (from 1784 to 1790) he employed a part of his evenings in different experiments, melting at each time in his blast-furnace three or four pounds of glass; he took care, in every experiment, to note down the substances and proportions of his combinations, the time of their fusion, and, as nearly as possible, the degree of heat to which he had subjected them; then, by an attentive examination of the results of his experiments, he endeavoured to discover the causes which had rendered his products defective, in order that he might obviate them on a subsequent trial. While occupied in these researches, he derived a strong incentive to perseverance, from the prizes which he understood to have been offered for this desideratum by different academies, and especially by the Royal Society of London, a copy of whose proposals was procured for him. At a later period he also learned, in a more positive manner, from the statements given in the first volume of the *Bibliothèque Britannique*, the almost total impossibility which existed of procuring flint-glass exempt from striæ; all this impressed him with the importance of the discovery at which he was aiming, and stimulated him in the pursuit. These experiments, however, made, as he observed, on too small a scale, all proved fruitless.

"At the age of forty and upwards, having relinquished the trade of watchcase-maker for that of maker of bells for repeaters, at that time very lucrative (since he could make as many as 24 in a day, for which he was paid five francs each,) he resolved to prosecute his experiments on a more extended scale. Having purchased a piece of ground in a retired place on the banks of the river Doubs, near the Brenets, where his establishment is at present situated, he constructed, with his own hands, a furnace capable of melting at one time two hundred weight of glass, and settled there with his family on a very economical plan, in order to dedicate all his earnings and leisure to new and expensive experiments.

"His perseverance, however, had to overcome many untoward accidents, which would probably have deterred most persons from continuing the research. At one time his furnace, which he had not been able to construct with the requisite precautions, threatened to burst while heating, and he was obliged to rebuild it with materials procured from abroad; at another time it was not until after having employed several days, and consumed much wood in heating it, that he noticed an essential defect in its construction, which obliged him to suspend the melting. Sometimes his crucibles, which he had procured at great expense, or manufactured himself, cracked without his being able to discover the cause, and the vitreous matter escaped among the ashes, and was lost. After each of these trials he was obliged to employ a longer or shorter interval in earning the means of subsistence, and of purchasing wood, and the necessary materials for his furnace, his crucibles, and his glass. These fruitless attempts discouraged him on some occasions, but on others excited him so as to deprive him of rest, and he meditated day and night on the probable causes of the accidents, and on the means of obviating them. At length, however, he obtained a block (*culot*) of glass, of about two hundred weight; having sawed this block vertically, he polished one of the sections, in order to examine what had taken place during fusion, and the following were the appearances:—On the upper surface of the vitreous matter there were many little semi-globules, which had the appearance of drops of water, terminating by a thread or little tube of greater or less depth, at the extremity of which there was a small spherical bulb. The cause of this appearance was, that these drops and tubes consisted of a denser kind of glass than the rest of the block. In another part there arose from the bottom of the crucible other cylinders, or tubes, terminating also in a kind of swelling or bulb; these had a hollow appearance, because they were formed of a substance less dense than the rest of the glass; and, lastly, here and there were seen specks, or grains, ending with a tail or train of a substance also less dense than the rest of the mass in which they floated; these, on account of their appearance, he denominated *comets*.

"The original cause of the non-homogenity of strongly refractive glass being once ascertained, the question was, how to remedy it? and it was here in particular that M. Guinand had great obstacles to surmount.

"Here we would gladly relate the numerous experiments by which M. Guinand at length accomplished his grand discovery; but as it still serves to procure for him some compensation for his labours, we should be unworthy of the confidence he has reposed in us, were we to enter into any detail on this subject. We shall therefore only state, that after many

expensive trials, M. Guinand having been so fortunate as to obtain glass of which some parts were perfectly homogeneous, and therefore destitute of those striæ, or threads, from which flint-glass is so rarely found free, he reflected on the different circumstances which in this experiment might have contributed to so happy a result, so that in subsequent attempts he obtained blocks of glass possessing larger portions of homogeneous substance, and at length he has almost arrived at a certainty of obtaining, in the fusion of from two to four hundred weight of glass, at least one-half of that substance perfectly homogenous, and consequently fit for optical purposes.

"Unable to make any farther progress, he admits that his processes have not yet attained all the perfection which might perhaps be desired; but as he has by these means succeeded in making disks, perfectly homogeneous, of twelve, and in one instance even of eighteen inches in diameter, and having no doubt that, in operating on a greater scale, he might easily be able to obtain one of a diameter double or triple the extent of those last-mentioned, he justly concludes that his process has at length removed the obstacle which the non-homogeneity of flint-glass opposed to the construction of large achromatic object-glasses.

"Guinand having become acquainted with Captain Grouner, of Berne, an intendant of the mines, the latter had occasion in Bavaria to speak of his improvements; and a short time afterwards, in 1804, he asked him, on the part of M. Frauenhofer, the chief of the celebrated establishment of Benedictbeurn, for some specimens of his glass. The letter of M. Grouner at once testifies the high esteem he had conceived for M. Guinand, and his earnest wish that his discovery might be rendered useful. M. Frauenhofer, after examining these specimens, and requesting several disks of the glass, was so well satified with them as to repair in person to Brenets, a distance of about 260 miles, where he engaged M. Guinand to take a journey into Bavaria. Having arrived in 1805, he determined to settle there; and during a residence of nine years he was almost solely occupied in the manufacture of glass. It is from this period that M. Frauenhofer's achromatic telescopes have acquired so well-merited a reputation.

"Among the telescopes made by M. Guinand, there are several of remarkable magnitude and effect; in general, the greater part appear to advantage on comparison with English telescopes; a merit which is owing, in an especial manner, to the quality of the glass. But the most singular circumstance attending them is, that they have been constructed by an old man upwards of seventy, who himself manufactures the flint and crown glass which he uses in their construction, after having made with his own hands his vitrefying furnance and his crucibles; who, without any mathematical knowledge, devises a graphic method of ascertaining the proportion of the curves that must be given to the lenses, afterwards works and polishes them by means peculiar to himself, and, lastly, constructs all the parts of the different mountings, either with joints or on stands, melts and turns the plates, solders the tubes, prepares the wood, and compounds the varnish."

PORTABLE PUMPS FOR EXTINGUISHING FIRE.

Sir,—In Nicholson's Philosophical Journal for June, 1803, I met with a letter from M. Van Marum to M. Berthollet, containing an account of some experiments showing the method of extinguishing violent fires with very small quantities of water, *by means of Portable Pumps;* and as this method appears to me, from its simplicity, capable of being made extremely useful, not only in crowded cities but on board ships, I request you will have the goodness to give it a more general circulation by inserting the following brief account of it in the Mechanics' Magazine.

The experiments of Van Aken, a Swede, which were published in 1794, and which gave rise to Van Marum's, were performed with a liquid of the following composition, viz. 40 lbs. of sulphate of iron, and 30 lbs. of sulplate of alumine, mixed with 20 lbs. of the red oxide of iron and 200 lbs. of clay. By a series of experiments Van Marum proved that fire was always extinguished more quickly with common water, used in the same manner, than by this anti-incendiary liquor; and "I observed (he says) at the same time, that a very inconsiderable quantity of water, if judiciously directed, would extinguish a

very violent fire." The result of his first experiment was the extinguishing the fires of two casks covered with pitch, their heads taken out, and highly ignited, *with only four ounces of water*. I shall give you his instructions at length, as follows:—

"According to these experiments, it appears that the act of extinguishing a violent fire with a small quantity of water consists in this—that the water be thrown on that part of the fire which is the most violent, so that the quantity of steam produced, which suppresses the flame, may be the greatest possible; that water be continued to be thrown on the neighbouring inflamed part as soon as the fire has ceased in that on which the operation was begun, and that all the burning parts be visited in this way as quickly as possible. By thus following the flames regularly with streams of water, they may be every where suppressed before the part on which the operation was begun shall have entirely lost, by evaporation, the water with which it was moistened: this is often necessary to prevent the parts from breaking out afresh, for, on the principle above mentioned, a burning body, of which the flames are suppressed, cannot be again in flames until the water thrown on it be totally evaporated."

In May, 1797, Van Marum prepared a shell of dry wood, forming a room 24 feet long, 23 feet wide, and 14 feet high, having two doors on one side and two windows on the other; the inside was strongly pitched and covered with twisted straw, wood shavings, and cotton soaked in turpentine. "Very soon after lighting it, (he says) the flames being rendered more brisk by the wind, were every where so violent that it was considered by my assistants as impossible to extinguish them. I succeeded, however, after the method above directed, in little more than four minutes, and with five buckets of water, a part of which was wasted by the negligence of my assistants."

This experiment was repeated in the same month, and the fire extinguished in three minutes, with less than five gallons of water.

A similar experiment was repeated with equal success, by Dr. Van Marum, in the presence of the Duke and Dutchess of Gotha, at Gotha, in July, 1798; an account of which was published by the celebrated astronomer Von Zach, in a German periodical paper entitled *Reich's Anrieger*, 6th of August, 1798, No. 119, where he assures us, that *the fire was extinguished, with three buckets of water, in three minutes, with a small portable pump.*

Van Marum concludes with the following observations:—"In operations of this kind particular attention must be paid to throwing the water in such a way that the entire surface of the burning part shall be wetted and extinguished, and that in such a way that an extinguished part shall never be left between two others which are in flames; for, if attention be not paid to this, the heat of the flames burning here and there will quickly change the water, with which the part has been wetted, into steam, and the whole will again take fire. In order, then, to extinguish a fire in all cases, no more water must be thrown on the burning part than is needful to wet the surfaces, and this I conceive to be all that is requisite to extinguish a fire, whatever may be the circumstances of its origin."

In 1807, Mr. Hornblower, with whose talents the world is well acquainted, constructed a fire-engine which stood in the compass of fourteen inches square and two feet high, and could be carried from one room to another with ease. He found, by experiment, that the four sides of a bed-room, all on fire, could be extinguished in a minute by little more than a pail of water. All that is required is, to keep the engine filled in its proper place, and to work it off every month or six weeks, for the purpose of changing the water, and ascertaining that it is in proper working state.

I am, Sir, &c.

NAVARCHUS.

ON SOAP.

AMONGST the various articles that are consumed in every family, and which, of course, are of great interest to the whole of the community, there is scarcely any in which the prudence of a house-keeper, especially in the middling classes of life, is of greater consequence than the article *soap*.

This substance is of daily use; and it forms an item of continual recurrence in the weekly accounts of a house: hence it is of importance that the housekeeper should be duly informed of its composition, and of the frauds which are sometimes practised in respect to the *quantity of water* that is united with it, beyond that proportion of water which is absolutely essential to the existence of the soap itself.

It was formerly thought that this cleansing article was of a nature very different from that of salts; but modern chemists have overturned all our old notions on these subjects. While almost all the stones of our forefathers are pronounced to be salts, we cannot be surprised at their including soaps in so general a term as salt is at present. Under the influence of these generalizing principles, soap is now esteemed, chemically, as an oleate, or combination of the oleic acid—a name given to that state in which the only constituent exists in the soap, whether it be supplied by tallow, rosin, common olive oil, or the fish oils. This oleic acid seems changeable, by slight causes, into many varieties.

It is well known that soda is the alkaline basis of the *harder* kinds of soap, being introduced from the barilla or kelp employed in its manufacture, and partly from the common salt, (or muriate of soda) used to promote its separation from the alkaline ley. Potash on the other hand, is the basis of the *softer* soaps, and is introduced into them by the use of either potash or pearlash, in their manufacture.

Soap made of soda and tallow alone, is too hard for common use; on which account it is usual to add a portion of potash in the manufacture of soap for common purposes. Our usual *white or curd soap* is made by first passing water through about 6 parts of barilla, 3 of Amercan potash, and 4 of quick lime, mixed together, until the ley is so charged with the soda extracted from the ashes, that a bottle holding 5 ounces of water, will hold 6 oz. of the ley. A portion of ley is then boiled with about 13 parts of tallow, and being cooled, the spent ley is drawn off, and fresh added; until, by repeated boilings, the whole has been exhausted: at which time about 1 part of common salt, mixed with 3 of water, is added, partly to promote the entire separation or curdling of the soap from the water, and partly to render the soap harder; which it does in quality of being a muriate of soda. The soap separating completely, it is then laded into frames, and, when cooled, cut into bars. The produce of the above proportions is generally about 24 parts of soap, and 1 of waste stuff, used as manure.

The common *yellow soap* is made from the ley obtained from about 6 parts of barilla, 1 of potash, and 5 of quick lime, boiled in separate parcels, with about 13 parts of tallow, 3 of rosin, and 1 of palm oil; and finished by adding one part of common salt, as in making curd soap. The produce is about 26 parts of yellow soap, and 5 of waste.

These hard soaps, as found in the shops, vary greatly in their proportion of water. In the best sorts, the water should form little more than one quarter of the weight of the soap; but in some soap, which is sold at a lower price, it forms more than half the weight, and is thus an intermediate kind between the true hard soap and the soft, in which a considerable quantity of water is left on purpose.

The purchaser of this reduced hard soap not only pays, in fact, dearer than for the real soap that he buys; but, in consequence of this excessive quantity of water, the soap is so much easier melted in the water used for washing, that a larger quantity of the

real soap is required than would otherwise be necessary, to perform the same work; so that it is *doubly extravagant.*

As clayey bodies also possess a cleansing quality, they have been employed in the fulling business instead of soap; but this practice is gradually declining, and the use of soap in fulling is now generally preferred. The admixture of the fine clays, as fuller's earth, with soap has been attempted for sale, either as an adulteration, or avowedly to reduce the price, or to improve the quality. When economy is highly requisite, an admixture of this kind in washing, provided plenty of water is at command to rinse the clay out of the clothes, might perhaps be advantageous, at least for the coarser articles. The mixture may be made, merely by pounding the soap and fuller's earth together, and forming the mass into balls. This mixture also possesses the valuable quality of being not so easily dissolved as pure soap; but it has been, in all cases, difficult to introduce even decided improvements into the domestic economy of families: although the general diffusion of education and information leads us to hope that this reproach will in future be wiped away.

USE OF THE PLUMMET.

Sir,—The Plummet is an instrument of such general application, that any improvement in the mode of using it will be viewed with some interest by the attentive mechanic. The ancient ball of lead, of a spherical form, has been for a long time laid aside by the superior artisan for the *conical* plummet, by which a person is enabled to determine the correct spot under the point of suspension, which could not be done so accurately, and with so little trouble, by the spherical bob.

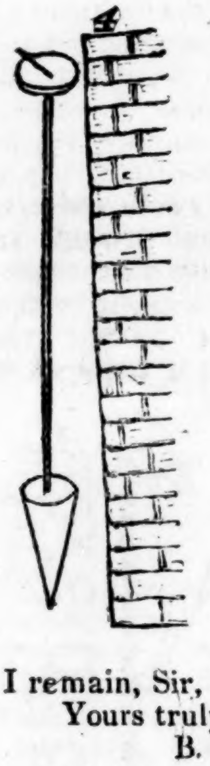
I have, for many years, made an addition to the conical plummet, which is very simple, but not the less useful; it consists of a *circular plate* of brass, or other metal, with a small hole in its centre, to admit the plumb-line. This circular plate being made *exactly of the same diameter* as the largest part of the conical weight or bob, serves at once to prove the truth or accuracy of any vertical wall or plane, without the addition of the plumb-rule, and is applicable at once to walls of any height; for, when the upper part of the line is placed in the centre of the above-mentioned circular plate, and the edge of the plate held in contact with any upright wall or post, the surface of the conical weight will also be in contact with the lower part of the said plane, provided it is truly vertical: and if it should have any inclination, or be out of upright, the plummet will discover the quantity by its distance from the wall, in case it overhangs, and in case it recedes or batters, the distance of the circular plate from the upper part of the wall or post will measure the quantity of declination or battering.

As the line attached to the plummet may occasionally have knots upon it, I have found it convenient to make a narrow slit sufficient to admit the line from one side of the said plate to the centre. The mode of application, perhaps, may be better understood by the following figures:—

When the plane is upright.

When the plane inclines backward.

When the plane inclines forward.



I remain, Sir,
Yours truly,
B. BEVAN.

STEAM NAVIGATION—COMPOSITION OF FORCES.

SIR,—It appears from the experiments of Bossuet, in company with D'Alembert and Condorcet, who undertook a series of experiments on the resistance opposed to the motion of vessels in water, that the resistance is as the square of the velocity. Several other philosophers, both on the Continent and in Britain, have come to the same conclusion; we may, therefore, consider the fact as established. From the law of the composition of forces, if any force propel a body through a given space in a given time, and if, then, another force equal to the first is made to act upon the body in the same right line, the velocity will be doubled. But this is only to be understood as applicable to bodies moving in an unresisting medium; therefore the resistance of fluids being as the square of the velocity, the velocity will be expressed by the square root of the sum of the squares of the given velocities: hence it is evident, if we put $a =$ to the velocity communicated by steam, $b =$ to that communicated by the wind, and $v =$ to the compound velocity, we shall have $v = \sqrt{a^2 + b^2}$; which formula, applied to the present case, will give $v = \sqrt{6^2 + 6^2} = 6\sqrt{2} = 8{\cdot}4852$. In the above solution the wind has been supposed a constant force; but that not being the case, a small deduction must be made on account of the increased velocity of the vessel. It may also be worthy of remark, that two forces acting in the same right line, in a fluid, produce the same effect that they would do if acting at right angles to each other in an unresisting medium.

D. S.

EVAPORATION.

SIR,—Having made observations, in Bedfordshire, on the quantity of evaporation for several years, and seen the result of similar observations in other places, and finding Dr. Bostock's quantity fall so much short of the average of other places, I presume there is something very particular in the situation of the Doctor's vessel, or some mistake in the deductions. My vessels were always exposed to the free action of the air, but screened from the direct action of the sun. The quantity evaporated in the summer months sometimes amounted to five inches per month; whereas, the monthly quantities, deduced from the hourly quantities in the abovementioned table, will not amount to one inch; and the total, for the eleven months given, to about six inches, instead of twenty-four, as found in this and other parts of the country.

B. BEVAN.

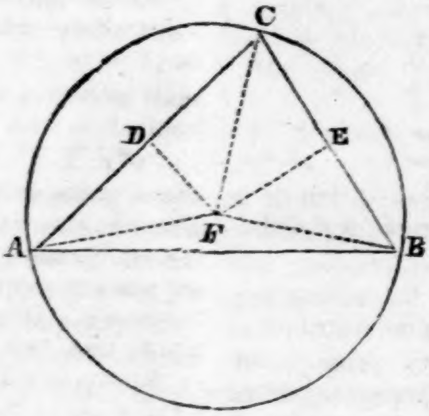
MECHANICAL GEOMETRY.—No. VII.

(Continued from No. 12.)

PROBLEM XI.

About a given triangle to describe or draw a circle.

Let ABC be the triangle; we are required to draw a circle round it that shall pass through the angular points, A,B, and C. Bisect AC in D, and draw DF perpendicular to AC; also besect, in like manner, CB in E, and draw EF perpendicular to CB, then the intersection of the lines DF and EF is the centre of the circle, and AF, CF, and BF, are all equal to each other; therefore (by Definit. I. Part II.) with either of these lines as radius, describe the circle from the centre, F, and the Problem is performed.

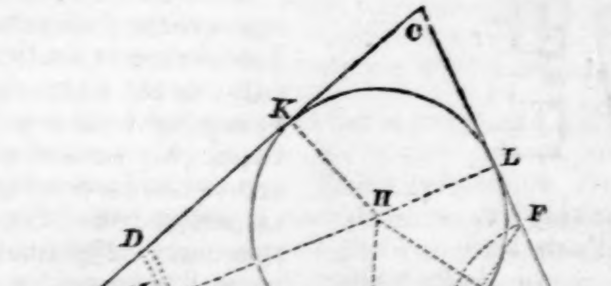


NOTE.—The reader will perceive that this Problem is but an application of what was shown in Problem IX. Part II. for the points A, B, and C, are, by the conditions of the Problem, supposed to be in the circumference of a circle.

PROBLEM XII.

Within any triangle to inscribe or draw a circle that shall touch each of its sides without cutting them.

Let ABC be the triangle within which we are required to draw the circle, IKL.



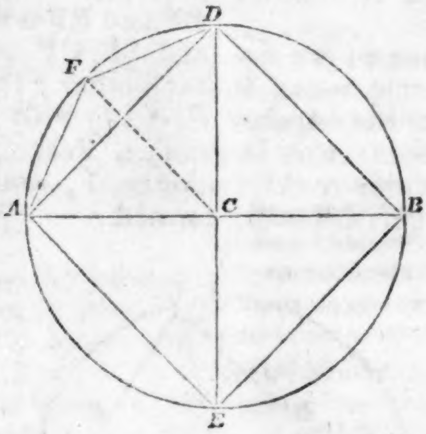
With A, as a centre, and with any radius, as AD, describe the arc, DE, and draw the chord, DE, which bisect or divide into two equal parts, as at M (by Problem VII. Part II.) and through that point draw a line from A, as AH, extended towards the side, BC, of the triangle; in the same manner draw the arc, FG, from B, and bisect it. Draw BH towards the side, AC, then will the intersection of AH and BH be the centre of the circle; then from H draw H I perpendicular to AB(by Problem III

Part III.) then is H I the radius of the circle which will touch all the sides, that is, HI, HK, and HL, are all equal to each other.

PROBLEM XIII.

Within a given circle to inscribe a square.

Let A B D E be the given circle:—draw any diameter, as A B, and perpendicular to that diameter draw another diameter, DE;—join AD, DB, BE, and EA, and it is done.



Note.—This Problem, though so very simple, is not only of extensive application to every mechanic, but furnishes the means of describing any polygon in a circle whose number of sides is divisible by four; thus, if we wish to describe an octagon, after first describing the square, as above, bisect any of the sides, as AD; then, drawing CF perpendicular to AD, and joining AF, it will be the side of the octagon, as was required; also, if we again bisect AE in like manner, we shall have the side of a polygon of sixteen sides, and so on continually.

G. A. S.

BRICKS.

Sir,—Mr. Elmes has given a portion of an outline of the important and necessary art of Brickmaking, but which, to many of your readers unacquainted with that art, is almost useless, merely giving some names and colours of particular bricks. I hope Mr. Elmes, or some other of your Correspondents, will clear up, for the information of your numerous readers, the following *desiderata*, namely:—

Whence the colour of bricks?—That it is not solely iron, is proved by many or all of the same mass being parti-coloured; being white where they are supposed to touch others in the kiln, and red in the remaining parts of the same brick.

The art of making the pale yellow may, of course, be done by mixing chalk, and dirt, and odure, as is done in the vicinity of London; these are only for show, not compactness.

Can bricks be made with clay alone, without any mixture whatever but sand to separate them from each other in the kiln, and to clear the moulding frames?

How is the pug-mill made? I find no description of it in the Encyclopedias.

And, above all things, what is the cause of the *porous* and *dense* bricks? The former are sometimes so light and brittle as to break with their own weight, and suck up water like a sponge; the latter are often so hard as to bear hammering on like an anvil, without breaking, and at the same time so close-grained that they resist water like marble.

What is the cause of this, and how is this excellent quality of durability or density obtained? Of the porosity we would only know how to avoid it.

Also, how is the glazing of bricks performed? Some think it is done with salt alone, others that they are partially vitrefied by the heat of the

kiln alone. The cheapest way of glazing would be an advantage to be known, whatever it may be.

The above are some of the principal parts of the knowledge of brick-making, which, if Mr. Elmes will be kind enough to explain, or any other of your Correspondents, he will oblige many of your readers, particularly one in the centre of England, who is

A RUSTIC.

Bolnhurst.

N. B.—There is a white glaze, as in stone-ware blacking bottles, and another of a blue or slate colour, much used by the Dutch—how are these obtained?

MECHANICAL POWERS OF MAN.

SIR,—The Mechanical Powers of Man cannot fail to be an object of importance, more particularly in a country expanding in every branch of useful knowledge. The powers and laws of most of the visible bodies in the universe have been investigated, with great accuracy, by men of science, but few have taken the pains to investigate and ascertain the mechanical powers of man. It is true we find, in some of our best practical works on Mechanics, the result of a few experiments on the powers of man to carry burdens, and to draw a load horizontally and upon planes nearly horizontal, and also to raise a load by means of a windlass. But there are many other modes of applying the strength of man, which deserve notice, such as in the act of rowing a boat, lifting a dead weight, using an auger, a gimlet, a screw-driver, a bench and hand-vice, &c. &c.; most of which may be determined with sufficient accuracy for general purposes, by many of your readers, if they were to register the results of a few observations often in their power to make. By way of inviting communications of this kind in your useful Magazine, I beg leave to offer a list, as a specimen, to be corrected from time to time, as may be found necessary, premising that many ordinary operations are performed in a short space of time, and may therefore be done by greater exertion than if a longer time was necessary. Thus a person, for a short time, is able to use a tool or instrument called

	Lbs.
A drawing knife, with a force of .	100
An auger, with two hands . . .	100
A screw-driver, one hand . . .	84
A common bench vice handle . .	72
A chisel and awl, vertical pressure .	72
A windlass, handle revolving . .	60
Pinchers and pliers, compression .	60
A hand-plane, horizontally . . .	50
A hand or thumb vice	45
A hand-saw	36
A stock bit, revolving	16
Small screw-drivers, or twisting by the thumb and fore-finger only	14

At another time I may, probably, send you a few cases to exemplify the use of the above list.

B. BEVAN.

IRON TRADE.

It was with surprise, and we confess with some doubt as to the correctness of the statement that we read in *Trewman's Flying Post*, the extraordinary advance that has taken place on Iron; and, notwithstanding the caution and great respectability of that Journal, we were disposed to consider they laboured under some erroneous information; and so we should have considered at this time, had we not been assured, by a gentleman on whose veracity we can place the utmost reliance, that in stating "Bars, which some time since met a dull sale at 7*l.* per ton, can now scarcely be obtained for 13*l.*, while pig iron has even exceeded this, being now more than one hundred and twenty-one per cent. beyond what it was a short time since," they were correct.

That this article, in times like the present, when the demands of the Ordnance and the Navy are, for the present, unknown, should experience such a rise, is to many a matter of astonishment; but, we conceive, a little reflection will easily account for perhaps what is not within the records of history to parallel, and will likewise continue, if not to the extreme prices now quoted, at least very near them.

The legitimate effects of peace are now beginning to be enjoyed throughout a large part of the civilized world, and the

children of genius, enterprise, and industry, are calling into action those powers for which our country stands unrivalled. To give full effect to this, a great demand is necessarily made for this most valuable of all metals, as not any improvement of much importance can be effected without receiving its important aid.

Two railroads alone, now contemplated to be eligible for trading and commercial purposes, one from London to Edinburgh, and the other from Birmingham to Liverpool, with the necessary carriages for the conveyance of goods on them, will, we are informed by a Correspondent, require little, if any thing less than two hundred thousand tons!!

This, with a commerce extending now in every direction, with every possible encouragement, calls on the manufacturer to supply what must be produced by the inventive ingenuity of the mechanic, who, in his turn, to carry into effect the plan he has contemplated, must apply to the mine for this soul of his invention; and when we consider that those efforts, however boundless and colossal they may be in extent, are not, as in other countries, cramped and shackled for want of means to bring them to maturity, as the countless millions of our capitalists are ever ready to support any measure that carries with it the least probability of a moderate reward for the sum invested in the speculation: this encouragement, too, instead of decreasing, has a contrary effect every year, from the decreasing value of money in our public funds, which stimulates its tens of thousands to activity and usefulness, which the maddening influence of war had rendered hardened and indifferent to every valuable pursuit.

These are a few of the reasons which induce us to conclude that iron will continue to maintain high prices.—*Devonshire Freeholder.*

ADVANCE OF THE ARTS IN AMERICA.

Among the pleasing evidences of the rapid progress of the useful arts in the United States, which are continually falling in our way, we have now the pleasure to announce to our readers, that a gentleman of our acquaintance, who has long been engaged in the enterprise, has completely succeeded in producing a superior quality of that most useful and important article, CAST STEEL. This is made by a new process, on principles discovered by our friend, and at a *much cheaper rate*, than by any process hitherto known. A specimen of this steel, of a quality certainly as good as any ever imported, is now in our possession, and we learn that the rights of the discoverer are duly secured. Like every other *new* thing, it must struggle awhile, probably, with difficulties, especially as the inventor has not the capital necessary to put the system into actual and extensive operation. There can be no doubt that this will soon be done, or that it is capable of producing such a supply of steel, from our own ores, as to put an effectual stop to all importations. We hazard nothing in saying that the gentleman who has effected this grand discovery, the result of many years' study, and experimenting, will reap a rich harvest of honours and emoluments from his labours. This is as it should be, and we rejoice at the result.

New-York National Advocate.

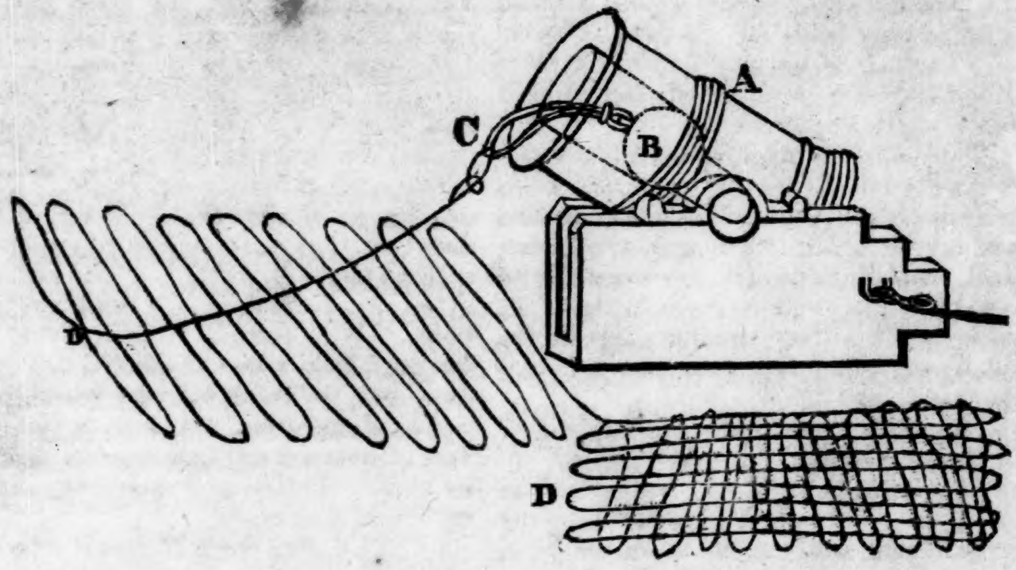
ENGRAVING UPON STONE.

We had an opportunity, on Saturday, of examining a specimen of engraving upon stone, which possessed the beauty and faithfulness of wood engraving. Mr. Meer, the gentleman who has discovered the means by which this may be effected, represents the advantages of stone cuts, as decidedly superior to those of wood; not among the least of which, will be noticed the impossibility of the stone's warping, an evil by which a wood cut, of any considerable size, is very soon injured. Engravings of any size upon stone, for books, newspapers, &c. may be cleaned in the *form* with the type, without injury, a process which would destroy the lines of a wood cut. The stone upon which the engraving is made, is very soft, and is hardened by a chemical process, after the engraving is performed. The cost of a stone *cut* will not materially exceed one upon wood.

United States' Gazette.

[We understand that Mr. Meer has patented the above improvement, for such it may truly be called; and we hope, on account of the advantages it offers, to see its use generally adopted. The mineral thus applied is probably clay stone, some varieties of which, in their natural state, may be readily cut with the graver, or even by a knife; but on exposure to heat, they change colour, become hard, and in appearance somewhat resemble common jasper.—Ed.]

BELL'S INVENTION FOR SAVING LIVES FROM SHIPWRECK.



SIR,—A great deal has been said, and I think to very little purpose, about the invention of the Mortar-plan for saving lives from Shipwreck. Your "Friend to Justice" makes it appear that Captain Manby claims the merit of this invention by his voluntary declaration: "I have never availed myself of any man's ingenuity; the whole has been the result of my own mind and perseverance." But Captain Manby, in his letter to you, denies having taken the credit for the invention, but claims to be considered the author; while your Correspondent "W. B." states that Captain Manby received the first intimation of the plan from a Captain W——. Now, had any of your Correspondents given to the public, through the medium of your very useful Magazine, a description of this invention, it might not only have set the dispute at rest, but have been of service to the cause of humanity along the whole line of the coast of Great Britian. With this intent, I send you the following description of the invention of Mr. Bell, which was tried and proved at Woolwich, on the 29th of August, 1791, and for which, if Mr. Bell had received a few of the thousands since given for this invention, I will venture to say it would have been gratifying to every true friend to Justice; but *Non cuivis homini contigit adire Corinthum* and *Infecilium pauci sunt affines.*

Tibi sum devinctissimus.

VINDEX.

Description of the Engraving.

A, Represents an eight inch mortar on its carriage; (of which Mr. Bell observes, that accidents from a gun bursting are effectually guarded against, by the chamber being constructed to contain but one pound of powder.)

B, the shell shown within the mortar by dotted lines; this was of cast iron, filled with lead, by which means Mr. Bell gained 7lbs. in weight, making his shell weigh 75 lbs. instead of 68lbs.

C, the grommet, or double rope, which connects the shell and line—this was of white three-inch rope.

DD, the line, French-faked, or laid in a zig-zag derection before and by the side of the mortar, as recommended by a French inventor of a similar plan, about the year 1790 or 1791.* Mr. Bell coiled his line on handspikes. The line first tried by Mr. Bell was a deep sea line, of which 160 yards weighed 18lbs. This line, with the shell, was thrown 400 yards from the mortar, elevated 45 degrees, and with a charge of only 15 ounces of powder.

Mr. Bell recommended his plans to be adopted as they are at present,

* See Naval Chronicle, vol. II. p. 428.

in the following remarks: "There is every reason to conclude that this contrivance would be very useful *at all ports of difficult access*, both at home and abroad, where ships are liable to strike the ground before they enter the harbour, as Shield's Bar and other similar situations; *when a line might be thrown over the ship*, which might probably be the means of saving both lives and property; and, moreover, if a ship was driven on shore near such a place, the apparatus might easily be removed to afford assistance; and the whole performance is so exceedingly simple, that any person, once seeing it done, would not want any farther instructions.

JOHN BELL.

Woolwich, Aug. 29th, 1791."

ERRORS IN NATURAL HISTORY.

The stories, that there is but one phenix in the world, which, after many hundred years, burns herself, and from her ashes rises another; that the pelican pierces her breast with her beak to draw blood for her young; that the cameleon lives only upon air; of the bird of paradise, and of the unicorn, are all fabulous.

It is an error that the scorpion stings itself when surrounded by fire, and that music has power over persons bitten by it; that the mole has no eyes, and the elephant no knees; that the hedge-hog is a mischievous animal, particularly that he sucks cows when they are asleep, and causes their teats to be sore.

It is said that the porcupine shoots out its quills for annoying its enemy, whereas it only sheds them annually, as other feathered animals do. The jackall is commonly called the lion's provider, but it has no connexion with the lion. The bite of the spider is not venemous; it is found too in Ireland plentifully—has no dislike to fixing its web on Irish oak, and has no particular aversion to a toad.

The ass was vulgarly thought to have had a cross on its back ever since Christ rode on one of those animals. It was also believed the haddock had the mark of St. Peter's thumb ever since St. Peter took the tribute penny out of a fish of that species.

It was anciently believed, says Brand, that the barnacle, a common shell-fish, which is found sticking on the bottom of ships, would, when broken off, become a species of goose. Nor is it less an error, that bears form their cubs by licking them into shape; or that storks will only live in republics and free states.

"The Rose of Jericho," which was feigned to flourish every year about Christmas Eve, is famous in the annals of credulity; but, like the no less celebrated "Glastonbury Thorn," is only a monkish imposture.

It is commonly believed, and even proverbial, that puppies see in nine days, but the fact is, they do not see till the twelfth or fourteenth.

TO REMOVE SPOTS OF GREASE FROM SILKS.

Take a little sulphuric ether, and wet the spot of grease with it; let the ether evaporate, and if the grease is not completely gone, it must be again wet with ether, which will have the effect of removing it without injury to the silk in the smallest degree.

The Chemist.

[The same liquid, by itself, or diluted with alcohol, or pure alcohol applied with a piece of sponge or cloth to grease spots on woollen cloths, several times in succession, with rubbing, will effectually remove them. Spirits of turpentine, which is commonly used for this purpose, possesses a vicidity which serves to attract the dust, and increase the size of the spots.—ED.]

INQUIRIES.

STAINING GLASS.

The most expeditious and cheap method of Staining Window Glass, so as to resemble colours burnt in? It is most desired to be done when the glass is in the frame, or light, as it is called.

C. R.

CRYSTALIZATION OF ALUM.

SIR,—I dissolve one pound of Alum in three pints of water, by heat; when cold, a considerable portion of this will crystalize. Possibly, among your well informed readers, some one would be good enough to say if there is any possible means to prevent the crystalization, and retain the full strength in solution, when cold, or very materially so, without discolouring the same.

A CONSTANT READER.